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OUR
SCHOOL BUILDINGS.

THEIR
CONSTRUCTION, HEATING, VENTILATION
SCHOOL HYGIENE, PHYSICAL
CULTURE, ETC.

V. Brown.

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BY

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OUR SCHOOL BUILDINGS, THEIR CONSTRUCTION, HEATING, VENTILA- TION, SCHOOL HYGIENE, PHYS- ICAL CULTURE, ETC.

By VALENTINE BROWNE, M. D.,
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Joseph's Hospital, etc.

The holidays are past and the pupils of the various schools are once more required to resume their studies and thus prepare themselves for the many and varied occupations they will be called upon to pursue in the near future. In view of this fact may we not be permitted to ask those to whom we confide the education of our children a few pertinent questions in relation to the school-buildings, the class-rooms, the mode of heating, ventilating, and air space, etc. ?

First—Have you the necessary number of school-buildings for the reception and proper care of our children ?

Second—Are your teachers well qualified, from their home and school training and experience, to teach our children ?

Third—Have you well-appointed gymnasiums in connection with your schools ?

These are important questions, and every one of them should be answered in a satisfactory manner. Some of our school-houses are manifestly unfit for use in these respects and should be relegated to the ranks of the long past and superannuated curiosities.

WHAT A SCHOOL-BUILDING SHOULD BE. ■

Some few years ago the Board of Education of New York City appointed a committee with power to award a valuable prize for the best plan of a school-building. After carefully examining several plans, the one selected embraced the following general conditions :

First—At least two sides of the building should be freely exposed to light and air, for which purpose it should not be less than sixty feet distant from any opposite building.

Second—Not more than three of the floors should be occupied for class-rooms.

Third—In each class-room not less than fifteen square feet of floor space should be allotted to each pupil.

Fourth—In each class-room the window space should not be less than one-fourth the floor space, and the desk most remote from the window should not be more than one and one-half time the height of the top of the window from the floor.

Fifth—The height of a class-room should never exceed fourteen feet.

Sixth—The provision for ventilation should be such as to provide for each person in a class-room not less than thirty cubic feet of fresh air per minute, which amount must be introduced and thoroughly distributed without creating unpleasant draughts or causing any two parts of the room to differ in temperature more than two degrees Fahrenheit, or the maximum temperature to exceed seventy degrees Fahrenheit.

Seventh—Heating the fresh air should be effected either by hot water or by low-pressure steam.

Eighth—The fresh air should be introduced near the windows ; the foul air should be removed by flues in the opposite walls.

Ninth—Water-closet accommodations for the pupils should be provided on each floor.

Tenth—The building should not occupy more than half the lot.

Most of these recommendations are excellent, but in our opinion there are some very important features omitted, such, for example, as the location of the building in its relation to dampness and troublesome noises, the formation of class-rooms and corridors, the location of drain-pipes, water-closets, and other seemingly insignificant yet important details.

The school-building should, in addition to complying with the above recommendations, be located, if possible, on a dry, porous soil, on a knoll or other elevation, away from noisy public thoroughfares and distant from shade-trees, so as to permit free access of sunlight into every class-room, and ample play-ground for the children. In case the above named condition cannot be procured and a school-building must be placed on a moist soil, then the following suggestions should be adopted :

First—The location of the building should be thoroughly drained by constructing a ditch outside of, and lower than the foundation wall, and then filling it in with loose stone to a depth of from twelve to eighteen inches.

Second—One or two similar drains should be made in the cellar and conveyed to a safe place to discharge. The cellar floor should be made water-proof by not less than six inches of well rammed concrete, or by asphalt, as recommended by Colonel Waring.

Third—The foundation wall should be protected by a coating of asphalt, and a like coating or layer should be placed in the wall just above the ground to prevent dampness from ascending, and a hollow place should be left in the wall between the outer and inner layers of brick or

stone so as to admit air and prevent moisture, and for the same reason the plaster should not be placed directly on the wall, but the wall should first be furred, lathed, and then plastered.

Fourth—The cellar floor should not be more than three feet below the surface of the ground, and the ceiling of the cellar or basement should be at least ten feet high, and it should be thoroughly lighted and ventilated, and should not contain a single water-closet, but should be kept scrupulously clean at all times.

Fifth—Cesspools and privy-vaults when used (in the absence of sewers) should never be located at a less distance than seventy-five feet from the school-building.

Sixth—The class-room should be, in addition to the conditions before referred to, separated by a corridor not less than ten feet wide and extending from front to rear of the building, and the school-house itself should always front either north or south, so as to have the class-room windows on one side face the east and on the other side face to the west, thus securing sunlight in every room.

Seventh—The building should not be more than three stories high (except in large, densely populated cities), the two lower floors to be used for class-rooms and the top floor for water-closets and a gymnasium.

DRAINAGE OF WASTE MATERIAL.

The system of conveying sewage from the school-house is one of the most important features in connection with school hygiene, and demands the utmost precaution at the hands of the authorities. Water-closets should never be placed in the cellar or basement of a school-building, because experience has shown and proved that it is utterly impossible to keep

them in anything approaching a sanitary condition. Every person acquainted with the law of the diffusion of gases will at once admit that the natural tendency of them is to ascend, and that this upward tendency is very much enhanced by the warm air on the floors above creating an upward current, carrying with it the offensive and dangerous odors from those water-closets. It requires no scientific demonstration to show with what facility those foul odors permeate every room in the building, because you have a practical illustration of the fact from your own kitchen during cooking hours. If you have any lingering doubt on this point just ask the cook to place some onions in the frying-pan over the kitchen-fire, or some carbolic acid, or oil of peppermint in hot water, with directions to stir a little, and then elevate yourself to the top floor, and you will be surprised to find the odors of those rosebuds there before you. If now you transfer the kitchen to the top floor, and tell the cook to repeat the dose, while you descend to the basement, you will not, you cannot, detect the invigorating perfume from those articles; hence the necessity of thorough cleanliness in cellars, and hence the absurdity and danger of placing those ill-smelling closets in the basement. The most appropriate and the most sanitary location for these closets is on the top floor of the house, and when proper precautions are observed in the arrangement of them, there cannot be the slightest objection to their presence there. These closets should be located at one end of the top floor, separated by a solid stone wall from the rest of the floor or gymnasium. They should be reached by means of an iron staircase, constructed on the outside of the building, with appropriate landings and connections for each floor. The staircase should be partly enclosed, somewhat after the manner

of the elevated railroad structures, to provide against inclement weather. The drain pipes should be of the best material, and should be thoroughly exposed along their whole course within the building. They should be located in a well-lighted portion of the building, so as to enable the janitor to detect at once the slightest leak or other defective feature in them. Again, the danger of taking cold by exposure to cold air and draughts on the way to and from water-closets placed outside of the school-building, would be reduced to a minimum.

Some of our school boards congratulate themselves on providing water-closets or vaults some twenty or twenty-five feet away from the school-building without any enclosed passageway leading to them, thus, they say, excluding from class-rooms all danger from sewer gas. I know many such cases, but there is one in particular where the school board for several years maintained two huge vaults, one on either side of the school-building, and hardly thirty-five feet distant, provided with no ventilation except what escaped through some lattice-work over the centre of the enclosure, extending not more than fifteen feet from the surface of the ground. It mattered little which way the wind blew, it was sure to convey the decomposed, sickening air from one or both of these vaults into the school-house. Some improvement has been lately accomplished by converting these vaults into water-closets, but the location and ventilation remain the same as formerly.

Would it not be inconvenient for children to climb two flights of stairs to reach the top floor? Not at all. It would only reverse the condition of climbing. In case the closets were on the ground floor, or outside of the building, they would first come down and then climb the stairs, instead of first climbing and then descending.

Besides, when stairs are properly constructed, the labor of ascending them will be a source of physical exercise, which the pupils should have.

While speaking on the subject of stairs in school-houses, perhaps a few remarks on their general construction may not be considered a digression. Stairs in a school-building should never be placed in dark, out-of-the-way corners, but should be located one at either end of the corridors, and facing the door and windows so as to be thoroughly lighted by the glass swinging vestibule-door and windows. Stairways should be fire-proof and provided with at least one landing half-way up, but should never be winding or spiral-shaped. "The tread should be wide and easy to climb. That portion of the corridors between the door and staircases could be utilized for clothes-closets, and these closets should be so constructed as to admit plenty of fresh air to the wraps." They should have ventilating tubes leading from the top of the same to a properly constructed ventilating flue provided in the wall of the corridors, so as to prevent possible contagious vapors ascending to the class-rooms from the wraps of the children not over-cautious in the care of their garments. Measles, scarlet fever and diphtheria are often communicated by means of these wraps when not properly aired and ventilated. Class-rooms, as before stated, should be large, well-ventilated, and in addition to the windows opening directly to the outer air, should also have not less than two windows, each say two and a half feet by three feet, opening into the corridor near the ceiling, and arranged so as to open and close at will, thus enabling the janitor to thoroughly flush the rooms and corridors during recess. By lowering the large windows and opening the small windows on both sides of the corridors a rapid current is at once established which will

effectually remove all impure air and foul organic matter usually found near, and often adhering to the upper portions of the walls and ceiling. In no other way, and by no known system of ventilating shafts can these impurities be so thoroughly removed from the class-room ceiling.

Class-rooms should be large enough to allow each pupil three hundred cubic feet of air space. This would require for a class of fifty pupils a room twenty-five feet wide, fifty feet long, and twelve feet high, or fifteen square feet of floor space for each scholar. How many school boards furnish this amount of space? We pause for a reply.

DESKS AND SEATS.

Desks and seats in the class-room should be placed so as to admit light on the left side of the pupil, and the most remote desk should not be more than twenty feet from the window on the left, and each scholar should have the sole use of one desk. There seems to be some difference of opinion as to the size, shape, and position of desks and seats in the class-room. Some think that a desk should be nearly flat, while others say it should be tilted. "In my opinion it should be nearly flat for writing on, and its edge should project over the front of the seat or chair, and the height should be so arranged as to allow the arms to slide over it without lifting the shoulders." While reading, however, the lid should be tilted so as to form a convenient book-rest. Desks embracing these qualifications can now be procured at very reasonable terms.

Perhaps there is more difficulty in supplying the ideal seat or chair to suit the various notions not only of the pupils but also of the teachers, or rather the school authorities, than in the selection of any other article of school furniture.

Some believe that it is necessary to support only the lower third of the back ; others declare in favor of a chair with a curved back ; still others say that support is needed for half the back ; yet others would allow only a narrow strip for the support of the spine, while quite a number would do away with chair backs altogether.

Among these conflicting opinions it seems hard to decide what sort of a chair to select. In my judgment the chair having a straight, upright back, somewhat concave from side to side, is the most appropriate for general school use. This kind of chair, I think, will be found the most convenient for writing, reading, drawing, copying, ciphering, etc.; in fact, for all work requiring an upright position.

Seats should not be placed too far from desks, but should be so placed as to allow the edge of the desk to overlap the front portion of the chairs. Desks and chairs thus shaped and placed will enable the teacher to correct many faulty positions so often assumed by school-children while occupied with their studies, and will prevent many of the deformities usually observed in young pupils.

Teachers should devote more attention to correcting the abnormal positions of pupils than they are in the habit of doing. It is a fact that neglect of seemingly insignificant details has been the cause of inflicting untold injury on numberless school-children. Any close observer cannot fail to notice the excessive number of boys and girls compelled to wear eye-glasses on account of defective vision caused by imperfectly lighted class-rooms and the position of black-boards on the walls, at which they are compelled to gaze so much during school hours. Many of the deformities so often seen among school-children are due to the unnatural positions which they are allowed, or perhaps compelled,

to assume during school hours, such, for example, as curvature of the spine, round shoulders, contracted chests, etc.—deformities which unquestionably pre-dispose them to fatal diseases and premature decay.

The spread-eagle-like position, so commonly indulged in by the pupil when at work, without any remonstrance from the teacher, is so manifestly detrimental to the physical development of the pupil as to demand thorough reform in this important department of school work. If teachers were a little more exact in correcting these abnormal positions in the pupils, by compelling them to maintain an upright attitude while engaged in school duties, they would not only prevent many of the deformities referred to, but would also confer lasting benefits on future generations.

Class-rooms should never be separated by glass partitions or glass sliding-doors, for the reason that it has been thoroughly demonstrated that such an ancient makeshift contrivance does not improve the character of light in the rooms remote from the windows, while it diminishes the light in the room next the window in a very perceptible manner. “The glass in the partition reflects a part of the light and throws it back and out of the window.” Glass also reflects light and allows part to pass through and out by the window on the opposite side, while the noise, at times unavoidable, in one class-room, becomes a nuisance to teacher and pupils in the next room, and *vice versa*.

Class-room windows should extend from, say three feet above the floor, to a point within six inches of the ceiling, so as to afford light to the students remote from them, and for the further purpose of thoroughly flushing the class-rooms at least three times a day during school-hours. These windows, however, should never be open

either from bottom or top when the temperature outside of the building is more than ten degrees lower than that in the class-room, on account of the marked tendency of some children to take cold. Yet when pupils and teachers alike experience that disagreeable condition of almost suffocation from hot, impure air, we must acknowledge that it is hard to resist the natural impulse which seems to prompt them to open the windows. When such conditions unfortunately occur, and fresh cold air must be had, the children should stand up and practice some rapid movements of the whole body, as required in many of our schools. Even with these athletic motions a sudden rush of cold air on the pupils has too often caused severe colds to be contracted by delicate children, and hence the necessity of vacating the class-rooms while they are being aired.

COUNTRY SCHOOL-HOUSES.

With these remarks in relation to large school-buildings in cities, we will now pass to an examination of school-houses in the outlying districts or country towns where a large building is not required. It has been, and I believe is still, the custom to run up a one-story shanty, about twenty by fifty feet, anywhere, regardless of the nature of the soil, cellar, or other important details.

The interior is sometimes decorated with a vestibule, and usually one class-room, in which imaginary lines are drawn to separate the various grades into which the pupils must necessarily be divided. The ceiling of this lofty institution of learning may be anywhere from ten to twenty feet high, and the building is provided with windows on every side, including also each end, and these windows are expected to furnish light and ventilation at one and the same time.

The class-room is large enough to accommodate forty persons, but in cases of emergency more than double this number may be admitted. The building or class-room must be warmed by a huge stove, placed usually in the centre of the room, where, in cold weather, it is expected to make itself red hot, regardless of the poison it evolves. The blackboard is placed between windows, and the children are required to strain their eyes in looking at it during their exercises, thus inflicting injury to the eyesight which in many cases can never be repaired.

School authorities seem to regard isolated or outlying district schools as matters of little consequence, either as to their location, construction, heating or ventilation, and as a natural sequence, those buildings are generally badly located, imperfectly constructed, too much lighted, indifferently heated, and completely devoid of ventilation, save only that furnished through the open doors and windows.

Why is this? Why make any distinction? The children in country districts are just as much entitled to properly constructed school-houses as those in the cities. The State or Church should not permit any such distinction. Farmers are taxed for maintaining the school as well as the business man or mechanic, and are justly entitled to equal school accommodation for their children.

Do they get it? A visit to any one of those barns called district schools will answer in the negative. Instead of erecting a shanty twenty-five by fifty feet, build a two-story house, any size from thirty-five to fifty feet wide by fifty to seventy-five long, as may be required, and let the two or more class-rooms be separated by a corridor, as recommended elsewhere, extending the whole length of the building. The first floor will offer ample class-room, clothes-room,

etc., while the second floor can be used for a gymnasium and play-room in wet weather.

In places where the number of school-children is limited, to say thirty or forty in a district, a one-story building may suffice. In that case the school-house should extend from east to west, and be provided with a corridor on the north side of the house, the class-room windows looking to the south only. By this arrangement the blackboard could be placed at the west end of the room, the pupils facing it, while the teacher's desk would be, of course, at or near the blackboard, thus allowing light to enter above and to the left of the children. In case of too much sunlight through these south windows, light-colored shades may be used to moderate and equalize the same at pleasure.

Drinking-water for school-children should claim the most earnest attention of school boards. In districts where city water is not available, well or cistern water is that usually resorted to. Well-water may be, and generally is, in country districts, safe to drink; but when, as sometimes happens, the well is located within a less distance than fifty feet from a vault or cesspool, the water in such well should not be used for drinking purposes, and a vault or cesspool placed at a less distance than forty feet from the school-house should have a ventilating pipe taken from the said vault or cesspool and conveyed to the outer wall of the school-house, and then extended to the highest point of the roof. By this pipe most, if not all, of the offensive odors from those foul receptacles may be removed beyond the roof of the building, instead of being drawn into the class-rooms, either through the cold air conduit or through the windows, as frequently happens. Each of these latter school-buildings, no matter how small it may be, should have a well-lighted and

clean cellar in which a good hot air furnace should be located.

GYMNASIUM.

Every school and educational institution ought to have a well-equipped gymnasium attached to it, so as to enable the pupils to cultivate and develop the physical as well as the mental faculties. This important branch of education has been too much neglected in our public and parochial schools, and, indeed, in many private schools, academies, and colleges as well. Of late years, however, not a few in charge of these institutions are waking up to a realization of the fact that physical education must soon become an important feature in the curriculum of the institutions under their care, and have accordingly provided gymnasiums for their students. Let the good work go on until every school, high and low, male and female, public and private, shall furnish its pupils with a systematic mode of acquiring physical culture, and thus enable them to blend and harmonize in a happy manner those two divisions of education, without which there cannot be a finished, healthy termination to school-work.

But, say many of our school-managers, these gymnasiums are very expensive and we cannot afford this luxury. Do not allow the expense to deter you from establishing what is a necessity, not a luxury. Better reduce your expenses in some other direction than graduate a mental Shakespeare enclosed in a physical Pope.

Physical training, like mental cramming, can be abused by over-exertion. Excesses, of course, must be avoided. The kind of exercise and the time devoted to it must be of a character suited to the particular student, for it is evident to even a casual observer that the amount and kind of physical exercise which may with safety

be indulged in by one, may prove too fatiguing to another. For example, would it not be absurd to require the same amount of physical exercise from a weak, debilitated-looking boy of, say twelve years, as that required from a healthy, robust-looking youth of the same age?

Physical exercise for school-children must be selected with great care and subject to the advice of the family physician, and under the eye of an intelligent instructor in gymnastics. Otherwise, instead of developing and strengthening the bones and muscles of the pupils, it may cause deformities of certain parts of the body, atrophy of one set of muscles and abnormal development of another. Hence the necessity for a competent instructor in every gymnasium.

In our day and time physical culture is gradually and effectually gaining in every civilized country. Intelligent people begin to see and understand that their intellectual faculties cannot attain that high degree of perfection so earnestly desired, unless they are intrenched or fortified by a sound physical frame, and that this condition cannot be achieved without physical exercise. "The body cannot become a perfectly working machine without culture, any more than the mind can become intellectually perfect without education." "Let me have a sound mind in a healthy body," says Juvenal, in his prayer to the gods. States and nations should show as much zeal for the cultivation and education of the physical as they do for the mental faculties of the people, because it is now a recognized fact that in those countries, ancient and modern, where physical culture formed an important feature in the education of the people, the highest type of the intellectual faculties was usually found.

"The poetry of Homer grew and lived on the same soil that produced Leonidas and his vet-

erans." In ancient Greece physical culture was from the days of Homer made an important part of the school curriculum. The education of the Greek youth was divided into three parts—grammar, music and gymnastics, to which painting or drawing was added by Aristotle. In the city of Athens gymnastic exercises occupied as much time as all the other branches or divisions combined, and were continued long after mental education terminated. There was not a Greek town without its gymnasium, and the large cities had several. History tells us that just before the time of Hippocrates gymnastics were made a part of medical study, to counteract the effects of indolence and luxurious feeding.

The wisdom which prompted the ancient Greek and Roman to introduce and perpetuate manly sports and games was abundantly manifested in the magnificent proportions of the Athenian, the Spartan, and the Roman. You cannot name a single historical person in the annals of those ancient countries that was not a trained athlete. Homer, Achilles, Patroclus, Plato, Aristotle, Socrates, Demosthenes, Hippocrates and a host of others renowned in ancient Greek history, were skilled in gymnastic exercises, and the fame of Athens as an educational centre attracted pupils from all parts of the civilized world.

The Romans, desiring to equal if not excel their Grecian neighbors, quickly adopted and utilized those invigorating games that contributed so much to render Greece almost invincible for so many ages, constructed the most magnificent and costly gymnasiums and bathing-houses combined, for the cultivation of the physical faculties of her people. But with the decline and fall of Greece and Rome came neglect of gymnastic exercise, loss of physical strength, and general depravity.

During the middle ages but little, if any, attention was paid to physical culture, and it was not until 1776 that any effort was made to revive the almost forgotten games and sports of ancient times, when Basedow united once more mental with physical exercise. From this small beginning the practice slowly extended, until in the latter part of the eighteenth century gymnasiums were extensively introduced into Prussian schools. In the year 1810 Jahn instituted the well-known organization called the turnverein, a body of athletes which materially enabled Prussia to expel the French from her soil more than any during the present century.

The revival of gymnastic exercises in Germany soon spread over most European countries, but not until 1848 did the contagion reach our shores, when the German exiles laid the foundation of the turnverein in New York, where it has flourished, and from which it has extended to almost every city in the United States. During the past ten years many colleges and some high schools have introduced gymnasiums; but as yet very few, if any, of the primary schools are furnished with these desirable institutions.

The kind of exercise best calculated to improve the physical condition of the average school-boy or girl is a matter which should receive special attention from the authorities. The physical exercise for the young pupil which affords the greatest amount of pleasure to the particular student is the kind that should be adopted. In recommending that exercise most pleasing to the individual do not understand or imagine that we are in favor of any athletic games having a vicious or demoralizing tendency. Not at all. The various sports and games so highly enjoyed by boys could hardly be recommended for girls. The exciting games

of base-ball, foot-ball, hand-ball, jumping, bicycle riding, climbing, boxing, bowling, running after a fire engine, military drill, and such like sports and pastimes, so exciting and attractive to boys, would hardly be the proper exercise for girls, unless they donned the Bloomer costume on such occasions. Even then we should still object to those violent forms of exercise for the fair sex on account of their exhausting character. Many of these games are being indulged in to excess by persons physically unable to stand the fatigue consequent upon such exercise.

Moderation in physical exercise is as necessary as in any occupation and should be indulged in accordingly. It is much to be regretted that most of those violent and fatiguing games are being resorted to during the warmest part of the day and year when repose is so necessary. We have often been surprised at the wonderful endurance of young men who will play base-ball under the burning rays of a mid-summer sun when the mercury registers one hundred and thirty degrees or more in the sun.

Do not understand us as being opposed to physical exercise for girls, because we know that exercise is just as requisite for girls as for their brothers, but somewhat different in character. They have croquet, lawn tennis, dancing, walking, skating, horseback riding, running, and certain kinds of indoor exercise in the gymnasium, all of which tend to develop bone and muscle and thus enable them to resist disease and enjoy long life and happiness.

There is no exercise more pleasing to the average school-boy or girl than a wild romp and unrestrained screaming for ten or fifteen minutes in the school-yard during recess. Such complete relaxation in the open air from the rigid rules of school discipline seems to infuse

new life into the pupils, by expanding or inflating their lungs with fresh air, while at the same time the foul air of the class-room is completely expelled. This important effect cannot be obtained by the system now in vogue in most, if not all, of the common, and many parochial schools, of opening the windows for a few minutes while the pupils stand and stamp. All that can be said in favor of this new system of prancing is that it is a little better than no air or exercise at all. Why? First. If the desks and chairs are properly placed there is no room for the pupils to stand erect, and they are forced to assume a position not of ease but of discomfort and contortion, and consequently are not at liberty to move the hands and feet as they would wish to or as they could in the playground, and while in this awkward position the windows are thrown open, the cold air thus unduly cools the class-room and causes delicate children to take cold.

For the foregoing and other reasons we think that school-managers are wrong in abolishing the old-time recess of fifteen minutes in the middle of each school session. No sound reason has been advanced in favor of the change except, perhaps, the co-education of the sexes, which we suppose forbids or precludes the emptying of all the class-rooms at the same time, the object being not only to afford fresh air and exercise for the pupils, but also thoroughly to flush all the class-rooms with fresh air. Whatever cause or combination of causes worked the change, whether it was co-education or some other absurd rule that prohibited this old and excellent method for furnishing air and exercise for the children, it is much to be regretted that the change ever took place in our schools.

Military drill has lately become an important feature in many schools and colleges, and it is

demanding and receiving much attention from interested parties. While it is admitted that this kind of exercise tends to correct certain abnormal positions in the rapidly growing boy, we cannot recommend its general adoption for boys under eighteen years of age, on account of the fatigue which it inflicts on the pupil, unless very judiciously practiced under the eye of a competent instructor.

In short, any long-continued exercise, having a direct tendency to fatigue, or unduly exhaust the pupil, should be avoided by the young athlete. Too violent exercise not only does not develop the muscles, but frequently retards their growth, and leaves the boy puny and delicate. "During the active growth and development of the body the bones are soft and spongy, and contain more blood, relatively, than those of the adult, and consequently are more liable to yield to violent exercise, thus causing inflammation and deformed conditions of those parts to take place." The vital organs, as well as the bones and muscles, are in process of rapid development, and are much affected by too violent exercise, and, as a result, we have enlargement of the heart, rupture of blood-vessels, and various other affections of those organs.

Bicycle riding is certainly an excellent form of out-door exercise for adults. But in order to procure the full physical development to be derived from the use of the wheel the rider must assume and constantly maintain a perfectly erect position on the saddle, and he must be free from all forms of grave organic disease, particularly disease of the heart, etc. The wheel should be well adapted in all its parts to the size, weight, etc., of the particular rider, so as to prevent the awkward and ungraceful positions so often observed among wheelmen on the public streets. The doubled-up or acute angle

sort of carriage too often seen on bicycles, not only does not develop the muscles or expand the chest and lungs, but actually retards the first and contracts the second set of muscles and organs. The lank, rapidly growing, stooping back lad should not practice cycling until the age of 21 years, and not then unless he can maintain an erect position on the saddle.

I regret to express this opinion of the bicycle, more especially on account of the fact that some of the gentle sex seemed determined to indulge in this masculine sport. While we are delighted to see young ladies indulge in out-door sports and games, still we cannot approve of certain kinds of those exercises so mentioned. Those occupations are, we think, too violent for the usually frail constitution of girls, and in no way tend to a vigorous development of their muscular system, but on the contrary, they have been the primary cause of certain ills requiring the aid of the physician.

In thus restricting our girls in the choice of athletic sports and games we differ materially from our ancient Grecian friends, who required their daughters to publicly exhibit their gymnastic proficiency before contracting marriage. But as there were no bicycles for the Spartan girl to ride in those days, we cannot dogmatically say what action their fathers would have taken in the premises. Certain it is, however, that the Author of our being did not deem it necessary to endow the female portion of mankind with the same rugged bone and muscle which characterizes the male element of creation.

OVERCROWDING CLASS-ROOMS.

In another part of this article we stated that in the opinion of the best sanitary authorities not less than fifteen square feet of floor room should be allowed to each pupil, the ceiling

being at least twelve feet high. In the higher grades some of our class-rooms afford a little more than half this amount to each scholar, simply because the attendance in those grades is small as compared with the lower grades, and not on account of the sanitary demands of the children. As we descend from a higher to a lower grade we find the class-rooms more and more packed, until, on reaching the lower grades of the primary department, it is not unusual to find children so packed in these imperfectly ventilated rooms as to render the air absolutely detrimental to the health of the inmates.

Picture to yourself a room twenty-five by forty feet with an average attendance of eighty persons, seated on hard benches or chairs, with the feet of the smaller ones lifted off the floor, no support to the back and no desk in front of them, closely packed together and forced to inhale poisoned air for two or three hours at a time. In this class-room there are three windows and one door, the only channels through which fresh air is admitted and foul air expelled. As you enter this department from the open air you at once detect something wrong in the character of the atmosphere. You notice a disagreeable, sickening odor, or combination of odors, which at first prompts you to retrace your steps. You observe the children seated as before stated, some with pale, sickly expressions, others with flushed faces, all listless and restive. If you remain in this room you imagine that the disagreeable odors are no longer present, your sense of smell for this particular air is for the time completely effaced, and you soon begin to feel the evil effects of the poison that is being conveyed to your lungs, your heart, and your brain. Carbonic acid that should have been purified or removed from the room remains to be again and again inhaled, thus slowly but

surely poisoning the system and destroying the vitality. Such is the general character of the air those children are compelled, by a cruel, iron-clad law, to inhale for hours in a so-called school-room. Children who were bright with rosy cheeks and as merry as the lambs of the field are, at the tender age of four or five years, shut up in those polluted apartments, and deprived of that which is most essential to the health and happiness of the individual, fresh air and exercise, and plenty of it.

Such school-rooms serve another very objectionable purpose in a superlative degree, and that is in the spread and propagation of such contagious diseases as scarlatina, measles, whooping-cough and diphtheria. The mode of conveying these contagious and infectious diseases through the agency of such packing is evident and may be summed up thus: A mild case of either of the diseases above named occurs at the residence of one of the children, so mild indeed that its nature is not recognized by the parents or others in the house. The little patient plays about with nearly his usual vitality, mixing with his accustomed playmates, or perhaps, as often happens, he continues to attend school for some time before the nature of his complaint is discovered, or until the disease has been communicated to other members of his class. Or the little student may be perfectly well and free from the actual disease himself, but his garments may be saturated with the fatal germs of diphtheria, contracted from a member of the family at home, or even from a neighbor's child. In this way whole schools have been exposed to the danger of infectious and contagious diseases despite the efforts of the most vigilant health authorities, and from this fertile source of contagion whole communities have been made to suffer irreparable losses.

The tyrannical law which compels children at the tender age of five years to attend such schools is as unjust as it is unconstitutional, and ought to be disregarded because it is an unwarranted attempt to interfere with the guaranteed rights of the citizen to force him to educate or train the intellect of the child at the expense of, and to the absolute detriment of, that vastly more important element of his being, namely, physical development.

Standard authorities tell us that each pupil should have not less than fifteen square feet of floor space, or from two hundred and fifty to three hundred cubic feet of air. Now let us consider the condition in a class-room which I have visited lately and see how much air space is furnished each child. This room is fifty by thirty feet, and an average of seven feet high, and seats one hundred and fifty children. Light and ventilation are furnished by six windows and two doors, and the room is heated by direct steam radiation. In other words each scholar has the liberal supply of seventy cubic feet of air space, or about one-fifth the required amount. How, in the name of humanity, can a child learn her lessons in a room like this? Is it any wonder to find them inattentive, listless, and stupid when subject to such deleterious influences?

Observe these children at the commencement of the school term and you will notice how fresh and animated they are, with bright, sparkling eyes and rosy cheeks, full of life and vigor. But a change takes place before the end of the school year which completely alters or changes the physical condition of the pupil. The fresh, buoyant, animated condition is gone, the rosy cheeks have been replaced by a pale, dull expression of countenance; the pupil is languid and longs for the termination of her imprison-

ment ; nervous headache, neuralgia and many other complaints torment her, and frequently the vitality is so reduced as to expose her to many contagious diseases and not infrequently to one or more of the lingering complaints that so often terminate in premature death, and thus forever close the perhaps bright prospects of the pupil of an overcrowded and imperfectly ventilated class-room.

The physical and mental outrage so perpetrated on children compelled to attend schools of this character should not be tolerated in a civilized community. It is bad enough to confine children for several hours in a room having the requisite amount of air space, but when they are packed like sardines in a box and forced to inhale over and over the poisonous exhalations from the lungs it becomes positively criminal. Why, we ask again, should such conditions be tolerated in a civilized country—a country which claims the right to educate our children, in violation of constitutional law ? Why should it disregard the just demands of our children ? If the Government has a right to erect expensive school-buildings, and spend fabulous sums on teachers, principals, and superintendents, and foreign languages, has it not the same right to furnish room and air enough for the scholars ?

If school authorities neglect to supply proper school accommodations what right have they to demand the attendance of our children ? It has been truly said that “knowledge is power,” but what use can a physical wreck make of the most complete education ? Better allow our children to grow up in comparative ignorance than to subject them to physical ruin by shutting them up in a class-room saturated with the germs of disease. Public schools, parochial schools, and even private schools, should look into this important matter before it is too late,

because the time will come when education and sanitation must harmonize.

ADDITIONAL REMARKS AND SUGGESTIONS.

WARMING AND VENTILATING.

The important question of furnishing heat combined with fresh air to our school-buildings is, I am happy to say, engaging the most earnest attention of not only architects, physicians and sanitarians, but the general public as well. Formerly architects paid but little attention to this important matter, preferring to devote all the skill of their art to the general construction of the house, its symmetry, etc., forgetting or perhaps not knowing of the danger that lurked in the magnificently frescoed rooms in the shape of foul air. During the last twenty years, however, quite a change has taken place with regard to this subject, and as a logical consequence much improvement has been achieved.

The need for better methods for warming and ventilation is especially apparent in our large public buildings, but in none is it more essential than in our schools. Although much progress has been made in the matter of ventilation, yet it will be admitted that there is still room for improvement and that we have yet to solve the problem of furnishing heat and ventilation in a manner at once economical and effective.

In order to sustain life in anything approaching comfort a body temperature of ninety-eight or ninety-nine degrees Fahrenheit is necessary. Various influences tend to either increase or diminish this normal standard, such, for example, as an overheated atmosphere, certain abnormal conditions of the body, etc., or a residence in any locality having a temperature from

thirty to forty degrees lower than that of the body, especially when the mercury drops to zero. For the purpose of guarding against these changes of temperature clothing and artificial heating are deemed necessary.

With regard to clothing as a means of economizing heat and protecting the body there may be some difference of opinion, modified by the climate and customs of the peoples. Whether Adam and his family utilized the fig leaf with a view to this object is a question which I will not just now undertake to answer. Certain it is, however, that any person living in a climate like ours parsimonious enough to refuse to provide himself with proper garments would soon regret his exposure to an overdose of free ventilation. Clothing is the first requisite for utilizing the temperature of the body by preventing rapid extraction of heat, and houses are required for shelter and repose, and in addition artificial heat for those houses in our inhospitable climate is an imperative necessity.

Having introduced this artificial heat into our houses the question which now naturally presents itself is, How shall we preserve the requisite amount of oxygen in this warmed air? The problem of maintaining the temperature of an artificially heated room at from sixty to seventy degrees F., and at the same time furnishing oxygen in volume even approximating the recognized standard of health is not fully solved, notwithstanding that many of the most eminent sanitarians in Europe and America have devoted much time and study to the subject.

The quality of the air required for ventilating as well as the quantity is very important. Atmospheric air as we usually find it is composed of twenty-three parts of oxygen, seventy-seven parts of nitrogen and about four per 10,000 parts of carbonic acid gas. It also contains

traces of ammonia and some watery vapor. Nitrogen and oxygen are always in a state of mixture or combination, but capable of being separated and analyzed, and the relative proportions are almost always uniform, no matter at what elevation. Samples of air have been obtained from an elevation of 21,000 feet, analyzed and found to agree exactly in oxygen and nitrogen with that taken near the surface of the earth.

Not so, however, with carbonic acid. The quantity and even the quality of this portion of the atmosphere is much influenced by local causes, such as persistent dampness, the absence of sunlight, decaying organic matter, etc., thus increasing the quantity of carbon dioxide from four to six and even eight-hundredths per cent. The quality of carbon dioxide is not altered to such an extent in the open air as it is in confined places. Carbonic acid is the resulting product of perfect combustion of carbon in dead and in living organic matter.

Ammonia, traces of which we find in air, is also influenced by local causes. It is diffused from decaying animal and vegetable substances on the surface of the earth, and it is also furnished by the electric currents produced during thunder storms and is washed by the rain into the ground. It has been suggested that the quantity of this gas found in a given surface should form an approximate idea of the amount of impurity in the atmosphere. The watery vapor, though constantly present in healthy air, varies in amount in different localities.

Since the discovery of ozone in 1840, by Schonbern, our knowledge of the action of this peculiar and highly important modification of oxygen in impure air has been materially improved, although its positive nature and action are not yet fully understood. When this gas is

present oxidation occurs with much activity. It destroys with great energy all volatile gases evolved from decaying organic matter.

Ozone is therefore a powerful disinfectant, attacking and rapidly destroying or neutralizing the impurities in atmospheric air, and it is known that one part of this gas will effectually purify 3,000,000 parts of impure air. Ozone is found in considerable quantity during and immediately after heavy rain storms. Flowers and plants seem to produce it under the influence of the sun's rays, but in the absence of this luminary they retain the ozone and give up carbon dioxide. It is not present in dark and filthy places. From an analysis made by Professor Nichol of air collected in a dark, filthy lane in Paris, we learn that the quantity of oxygen was found reduced to 13.79 parts instead of twenty-three per cent., while the quantity of nitrogen rose to 81.24, carbon dioxide to twelve per 10,000 parts, and sulphurated hydrogen to three per cent.

An atmosphere containing more than ten parts of carbon dioxide to 10,000 parts of air is detrimental to health, and when it rises to fifteen parts per 10,000 may cause death. In fact odors, exhalations or conditions that materially alter the normal proportions of the atmospheric air, tend to debilitate the system and predispose the individual to disease and discomfort.

We have attempted to explain the relative proportions of the air we breathe outside of school-buildings, and at the same time demonstrate the changes which take place in the relative proportions of the same, their effects on the human system, etc.

As before stated, atmospheric air essentially consists of a mixture of oxygen and nitrogen, yet we generally find about four volumes of

carbon dioxide in 10,000 volumes of this air, but when it is introduced into a class-room of the ordinary size occupied by fifty persons and provided with the defective sort of ventilation usually found in such rooms, the relative proportions of this air are materially altered. This alteration in a crowded class-room takes place in a remarkably short time, and the longer the occupation continues the greater the alteration or pollution becomes.

A properly ventilated class-room should not contain more than four volumes of carbon dioxide in excess of that found in air outside the building, but when this dangerous gas amounts to ten or more parts in 10,000 the air is acting as a slow poison on the pupils, and were it not for the fact that the windows are occasionally opened, or a recess allowed, complete exhaustion would soon follow.

In addition to this noxious carbon dioxide the air of the class-room is further polluted by still more dangerous and ill-smelling gases, such as the decaying organic matter expelled from the lungs and carbon oxide, the effects of which on the human system are extremely deleterious, for it is now known that one part of this latter named gas or poison in 10,000,000 parts of air attacks the blood, the red corpuscles of which it rapidly destroys, rendering the pupil pale and languid, and causing headache and often extreme prostration.

HOW NOXIOUS GASES ARE GENERATED IN THE CLASS-ROOM.

The chief source of impure air in school-rooms is the foul carbonic acid exhaled from the lungs of the pupils, each one of whom liberates an average of 340 cubic feet per hour. Professor Parks, and other equally high authorities, assert that the quantity of carbon dioxide thus

liberated is much influenced by age, sex, activity and repose, and that 340 cubic feet may be considered a fair average for each pupil.

Take a class-room twenty-five feet square, having a ceiling twelve feet high, and containing 7,500 cubic feet of air, including the average amount of impure air. There are say fifty pupils in this room of ages ranging from fourteen to eighteen years and each pupil exhaling about 340 cubic feet of impure air per hour. If we multiply these figures by fifty, the number of pupils in the room, we have 17,000 cubic feet of this sickening air in one hour, and in case the occupation is continued for three hours consecutively we would have not less than 51,000 cubic feet of this air, or nearly four times the amount of ordinary air found in an unoccupied class-room.

It is generally admitted by sanitarians that this exhaled air contains not less than four per cent. of the most noxious carbon dioxide. In other words, instead of furnishing an atmosphere containing eight or ten per cent. of impure air we generously provide the children with nearly 100 parts in 10,000.

In addition to these impurities in the school-room we have, when the rooms are heated by stoves, hot air furnaces, etc., a still more poisonous gas to encounter in the carbon oxide generated by the so-called base-burning, gas-consuming stoves, all uniting to render the air absolutely unfit to breathe, provided that there was no provision for the access of fresh air or an outlet for this impure air. But as the class-room cannot hold all of this air at the same time, its capacity being only 7,500 cubic feet, the greater portion 45,000 cubic feet must have found its way out of the room through some channel or other notwithstanding the efforts of the architect to confine it in the room.

How did this confined impure air escape from the class-room? There are various channels furnished, not by school boards or architects, but by nature's law, through which this impure air is forced from the room notwithstanding the fact that every effort is made by the authorities to exclude the cold, fresh air by providing storm doors, double windows and any amount of weather strips, forgetting or not knowing the fact that by excluding the fresh cool air they also prevent the escape of foul air.

But they cannot completely succeed. The pent up impure air in the class-room is waiting for a door to open, (a circumstance which must occur often in a crowded room,) when it rushes out with much force, while at the same time cool, fresh air forces its way through cracks, crevices, and badly constructed doors and windows to take the place of this escaped polluted air, thus furnishing some, though not enough, fresh air.

In case this natural ventilation through open doors and crevices does not occur, and if the class-room could be made absolutely airtight, the pupils and teachers could not possibly live, even for three hours, in such an atmosphere. From these facts it must be evident to every investigating mind that our children are often exposed to, and that they suffer from, the evil effects of impure air and defective ventilation in many school-rooms not only in cities but also in country district schools.

The question, therefore, which claims our attention in connection with this subject is how we shall improve on the present system of warming and ventilating our school-rooms without creating dangerous draughts.

One hundred years ago, or even less, it was customary to attempt the almost impossible

task of warming houses by means of grate fires and open fire-places. While the grate fire and open fire-place furnish ample outlets for foul air, they also removed nearly all the warmed air as well, and the inmates had to suffer from too much ventilation. Great improvements have been accomplished in the mode of heating since that time and the man who would now undertake to heat the air of a large class-room by means of a grate fire would probably be considered a fit subject for a lunatic asylum.

The introduction of the iron box or stove was an improvement on the open fire-place or grate fire in that it furnished more heat at a greatly reduced expenditure of fuel, but it proved very defective in the important matter of ventilation. Numerous improvements, however, have from time to time been made in connection with this apparatus, so as to render it very useful, when properly managed, not only for warming the room, but also for culinary and other domestic purposes.

Those improved, so-called base-burning, gas-consuming stoves, certainly give out much heat at a very moderate expense, yet they are dangerous if not well understood. How often have we entered a room warmed by one of these stoves to find the air heavily charged with that poisonous gas, carbon monoxide, and when we investigated the cause found dampers that should be open closed, throwing the product of imperfect combustion into the room and slowly poisoning the inmates.

Not so, however, with the hot air furnace. From this apparatus we get a combination of heated and fresh atmospheric air, and when properly made, placed and handled it is capable of supplying a very good quality of heat and ventilation at the same time. But even this does not give us the requisite amount of oxygen.

We must of necessity, therefore, have resource to other methods of artificial ventilation and heating.

A good hot air furnace in full operation, the wind and dampers being favorable, will convey to a school-building about 43,200 cubic feet of warm air every hour, or heat enough for 100 pupils. If the ventilation is even approaching anything near what is considered fair in character this warm air will be changed about three times every hour by foul air shafts or open fire-places. In case the school building is large enough to seat 800 persons, you will need not less than eight of those furnaces, or 345,600 cubic feet of warm air per hour. In order to properly ventilate the building or remove this quantity of foul air from the classrooms, foul air shafts capable of removing double this volume of air should be provided, if we desire to furnish anything approaching good ventilation.

The ventilation or cold air obtained through the hot air furnace is often defective and impure, for the following reasons :

First—Because of the direction and force of the wind.

Second—Because the cold air furnished is often contaminated by impure air taken from unsanitary locations.

In order to properly warm and at the same time thoroughly ventilate a school-house by means of a hot air furnace five conditions are necessary :

First—The cellar in which the furnace is located must be well drained, the floor well cemented, with high ceiling, thoroughly lighted, scrupulously clean, and free of decaying vegetable matter and rubbish of all kinds.

Second—If, unfortunately, a water-closet should be placed in the cellar it should be as

remote as possible from the furnace and inclosed in a separate apartment of mason work, having a window opening to the east, west or south, and provided with the very best sanitary basin, drain and vent pipes.

Third—The utmost caution should be observed in selecting the place from which the cold air is to be procured. It should never be taken from areas, damp, shady places, or from the vicinity of vaults, cesspools, or other filthy places; but when possible should be taken at a distance of not less than ten feet from the surface of the ground and from three different locations, east, south and west.

Fourth—The cold air box, or conduit, should be perfectly air tight in the cellar, but so constructed as to admit of access for cleaning, etc.

Fifth—The hot air furnace should be of the most approved make, the joints perfectly tight, and provided with ample space for holding water.

Unless these necessary precautions are observed and practically carried out you will be constantly exposed to danger from impure air. Too much caution cannot be taken in all the many apparently insignificant details of conveying pure air to the furnace, for this is the air which, after being heated, we must inhale in all parts of the house.

With your permission I will relate one of the many obscure causes of disease produced by carelessness or ignorance in connection with this system of house warming.

In a neighboring state five persons out of a family of thirteen were prostrated with diphtheria, three of whom died. The house stood alone on a hill, 300 feet above the sea, was thoroughly ventilated, the plumbing and drainage seemed almost perfect, the hot air furnace was of the most approved kind, every room was

well lighted and exposed to the sun's rays—in short all the surroundings were unexceptionable.

At the time diphtheria appeared in the house there was no other case in the town or neighborhood. No member of the family had been in contact with any person having the disease, and, in fact, no cause could be assigned until the physician in attendance discovered that the owner of the adjoining premises had caused the contents of a cesspool to be spread over the grass-plot some twelve days before the outbreak of the disease, and that the offensive odors arising from the decomposed matter were being drawn to and through the cold air conduit, which was located on that side of the house, and conveyed with the hot air to the rooms occupied by those suffering from the disease, while the members of the family who slept in rooms into which this hot air had no access escaped unharmed.

No argument of mine is necessary to convince you of the well known fact that cold air taken from or near the surface of the ground is charged with from two to five per cent. more carbonic acid than that ten feet higher, and that distance from the surface lends purity to the air.

Anyone disposed to doubt the danger of drawing impure cold air and conveying it with the warm air into the house need but have recourse to the simple experiment of testing for himself by igniting any material capable of emitting plenty of smoke and placing it at a distance of from twenty to fifty feet from the entrance to the cold air box, the furnace being under full headway, and note the direction taken by the smoke. He need not wait long before being convinced that the smoke is being rapidly drawn into the cold air box. And so it

is in the cellar in case of any opening in the cold air conduit.

Now let us follow the warm air into the house and there examine it and ascertain its nature, composition, etc. For this purpose we will select a room having no open fire-place, but large enough to contain 12,000 cubic feet of air. The room is well lighted, being furnished with four windows, but no other visible means for the access of fresh air. This room is occupied by an average number say forty persons, it being one of the high grade class-rooms. The temperature outside varies from zero to twenty degrees above, cold enough to keep windows and doors tightly closed. The furnace fire is taxed to and beyond its capacity, but the amount of hot air delivered in this room does not warm it. As you enter this apartment you at once detect a peculiar and very disagreeable odor. You feel there is something unpleasant in the atmosphere of the room. The air near the register is warm, but at a distance of ten feet from it is cold. The temperature of the room drops to fifty-five degrees, while at the same time coal is piled into the furnace.

Why is this? The cause is evident and may be summed up thus:

First—There is no provision for the admission of fresh air to the apartment except through the cold air box, which in this case is rendered almost wholly defective, as I will attempt to show by and by.

Second—There is no outlet for foul air except by accidental leakage.

Third—The unequal warming of the room is due to deficient circulation of this compressed air.

Fourth—This air is polluted by consuming or withdrawing the oxygen and liberating carbonic acid, carbon oxide and other offensive

vapors thrown or exhaled from the lungs, etc., of the occupants of the room, each of whom inhales an average of 340 cubic feet of air per hour, or about eighty-seven cubic feet of oxygen.

This of course means that the forty inmates of the class-room withdraw 14,000 cubic feet of air every hour, or about 4,240 cubic feet of oxygen, and at the same time liberate or produce about 13,500 cubic feet of vitiated air, containing nearly 3,400 cubic feet of the most poisonous kind of carbonic acid. If these conditions were maintained for say four hours consecutively there would have been withdrawn nearly 56,000 cubic feet of air, or about 13,600 cubic feet of oxygen, and nearly 55,000 cubic feet of impure air produced.

Fifth—The confined air is still further polluted, in case of night school, by twelve gas burners, each of which consumes about twenty-two cubic feet of oxygen and produces not less than twenty cubic feet of carbon dioxide per hour, and the further fact that the hot air is deprived of much oxygen while passing through the hot air chamber.

Sixth—From the above figures and facts it will be seen that during class hours an amount of oxygen equal to four times that in the apartment had been withdrawn or consumed, and that the remaining air was rendered unfit for inhalation, and were it not for the fact that some fresh air found access, by accidental leakage around windows and doors, life could not be sustained in this apartment.

Seventh—The hot air furnace does not always warm the house, or rather, certain rooms in the house cannot be warmed by the furnace. Why? Because owing to the direction of the wind, the locality from which the cold air is taken and the almost horizontal position of the

pipes at their exit from the furnace in the cellar, and the further fact of defective ventilation in these rooms, the furnace seems to go on a strike, if I may use the expression, at a time when its heating capacity is most needed.

A room badly ventilated cannot be warmed in very cold weather by your hot air furnace, no matter how well constructed it may be, for these reasons :

First—The class-room is already more or less full of impure cold air and there is no outlet for this air, even at the windows, the intense cold wind acting as a barrier, pressing and forcing back the partially warmed air or holding it at bay. and, as it is a recognized axiom in philosophy that two bodies cannot occupy the same place at the same time, the furnace is unable to deliver the requisite amount of warm air into the room.

Second—The furnace or cellar floor is too low (the distance from floor to ceiling) to allow ascent enough for the heat conducting pipes, or conduits, to rapidly convey the heat from the furnace to the room to be warmed.

Third—The cold air being taken only from one side of the building and the wind refusing to blow in the direction calculated to enter the cold air conduit, the hot air current is diminished, the fire does not receive the necessary amount of oxygen for active combustion and so it goes on strike.

In order to determine the actual character of air like that described above I have tested samples of the same and found it, in almost every case, unfit for human respiration. The tests were, of course, directed to the detection of carbonic acid. Some of those employed were very simple, affording only an approximate idea of impurities and capable of being used by most persons, while others were a little more complex and rather expensive.

The first and most simple test for the detection of carbon dioxide employed was by means of lighted tapers suspended at different elevations from the floor, the fact being known that oxygen is a powerful supporter of combustion and that carbonic acid is the direct opposite. The taper at the floor burns with a brilliant flame, that at five feet with much less brilliancy, while that near the ceiling refused to display more than an almost imperceptible light.

The lime water test, which is very simple and accessible to everyone, may be used in the following manner : Take a clear glass bottle, large enough to contain one-half pint. Pour one ounce or one-fourth of a gill of freshly made lime water into this bottle and let it remain uncorked in the room, the air of which you wish to test for half an hour or more. Then shake thoroughly. If the lime water becomes turbid it indicates an excessive percentage of carbonic acid gas in the room ; but if the lime water remains perfectly clear you have an almost positive guarantee that the air is pure, at least approximately.

The test composed of a solution of oxalic acid and baryta, which is somewhat complicated, and Dr. Billings's test were also employed, all giving results closely resembling Pattenkofer's analysis, the details of which would occupy too much time and space here.

Defective ventilation not only does not ventilate, but it pollutes the air and prevents the access of warm air into the rooms to be heated. Various methods are recommended to ventilate artificially warmed rooms but all are more or less defective.

Suppose we adapt the time honored system founded on the theory that carbonic acid being heavier than atmospheric air always dropped to

the floor, and, acting on this hypothesis, provision was made for the admission of fresh air at or near the floor at one side, and for the escape of foul air near the ceiling at the other side, with the notion, probably, of neutralizing the impure air at the floor, warming it, and then forcing it out at the ceiling; or perhaps the idea was to create a direct current from the floor to the ceiling and thus clear the room of both warm and cold air at the same time. Now while it is acknowledged that carbon dioxide is heavier than ordinary atmospheric air at the same temperature, it is equally evident that the relative conditions of these bodies are materially altered by the application of heat. The carbonic acid which we have to consider in connection with house ventilation is principally that exhaled from the lungs, and as this acid leaves the lungs at a temperature of about ninety-eight degrees F., it is much lighter than the surrounding air, being warm and in a state of expansion, consequently it rapidly ascends to the ceiling, and as the region of the ceiling is the warmest in all artificially heated rooms, especially at night, it remains there until the heat is withdrawn, when it cools and drops to the floor.

The old system of ventilation then does not ventilate, because when the cold air inlet is open the feet and legs of the inmates are chilled and the fresh air inlet is soon closed, while the impure or hot air outlet at the ceiling acts in a very capricious manner, sometimes when open permitting warm air to pass out, sometimes allowing cold air to pass in, and at other times refusing either ingress or egress—the cold air outside and the warm air inside fighting as it were for supremacy. In addition to the vitiated atmosphere in rooms thus ventilated, I found a difference of from four to six degrees

in the temperature in various parts of the same room.

There are several other devices employed for house ventilation too numerous to mention, each having some good features, but, in my opinion, the most efficient system is that which affords fresh air enough to completely change the atmosphere of the apartment two to four times every hour.

This can be accomplished only, as far as I know, in the following manner: The foul air outlets or flues should be much larger than the warm air inlets and capable of removing about 15,000 cubic feet per hour. These outlets in a large class-room should not be less than three in number and should be connected with an air shaft extending to and beyond the roof. These foul air outlets should be placed at the same side of the room where the warm air is introduced and at the floor. The foul air shaft or flue should be as straight as possible and have a perfectly smooth inside surface to facilitate the escape of the impure air.

These impure air outlets, however well constructed, will fail to remove the vitiated air in the class-room in cold weather unless aided by artificial heat. The writer has often observed the utter inability of such flues to accomplish the work expected. Indeed, it is not unusual to find them acting as cold air inlets instead of polluted air outlets, and hence the absolute necessity of furnishing some artificial heat so as to induce an upward current.

In school-buildings warmed by steam heat the air shafts could be heated at a very moderate expense by extending a steam pipe some distance through the shaft or flue, and houses otherwise warmed may, with advantage, employ illuminating gas for the purpose indicated. An open fire-place, in cases where it is in close

proximity to a warmed flue, will answer very well for an outlet, provided the open space is closed to a point within eighteen inches of the floor, and furnished with a smooth inside surface, etc.

In addition to the impure air outlets at the floor, each class-room should be provided with one or two outlets at or near the ceiling, so as to assist in removing the superheated, impure air usually floating in that portion of the class-room. These outlets are especially necessary during the months of May, June, September and October, when artificial heat is but little if at all required, and also in cases where rooms are used for night school, when the air is actually poisoned by illuminating gas.

The object in having more than one outlet in each room is to equalize the air currents and thus avoid dangerous drafts, and to insure a thorough circulation of warm air. The hot air is now introduced at the floor, and as it gradually ascends towards the ceiling it diffuses itself all over the room, and as it cools is slowly drawn to the foul air outlets near the floor and removed from the room, while the other warmer and purer air takes its place.

In order to accomplish this object thoroughly it will be necessary to provide pure atmospheric air for the furnace. The cold air conduit must be air-tight in the cellar, and the air must be taken from three points and away from tainted localities.

The object in procuring cold air from three different points is to insure an abundant supply of the article, no matter from what point the wind blows. In no other way can you maintain the constant exchange of air so necessary to healthy ventilation.

In rooms thus heated and ventilated the temperature does not vary three degrees in any

part of the room, the changing currents are hardly perceptible, and carbonic acid is seldom found in excess of the normal standard, even though the windows remain closed the whole day.

In case of constant occupation of class and recitation rooms, however, it is advised to open all doors and windows three times a day for five or ten minutes at a time so as to completely remove the offensive organic odors often clinging to the walls and ceilings. This mode of ventilation is especially adapted to the hot air furnace system of heating and to system heating by indirect radiation.

The Smead warming and ventilating system embraces many excellent features and all things considered is perhaps the best hot air and ventilating combination yet devised. This system is employed for warming one school-building in Yonkers, (No. 2,) and with very satisfactory results, notwithstanding the fact that the school-building and its surroundings are far from perfect. Much care and common sense, however, are necessary on the part of janitors and teachers in regulating the amount of heat and ventilation furnished by the Smead system.

Warming school-buildings by means of indirect steam radiation is one of the best, if not the very best, modes of heating now in use, provided the precautions before referred to in connection with the hot air furnace be strictly observed. This system essentially consists in coiling pipes in a chamber to which fresh cold air is introduced, warmed by steam and discharged into the rooms to be heated, as in the case of the hot air furnace, but the quality of the air is much better than that from the hot air furnace on account of a certain amount of moisture which it always retains.

This moisture is a very necessary qualifica-

tion and one not always obtained from the hot air furnace. The steam heat is more even and constant in character, not being nearly so much influenced by temperature, wind, etc.

The suffocating and poisonous gas, carbon monoxide, resulting from the imperfect combustion of carbon, so frequently detected in rooms warmed by hot air furnaces, is never found in rooms warmed by steam.

The excessively dry character of furnace air, so irritating to the respiratory mucous membrane, is never found in houses heated by steam. For these and other reasons too numerous to mention, heating school-buildings by indirect steam is recommended.

Warming class-rooms by direct steam radiation is not recommended unless great attention is devoted to the important matter of furnishing fresh, pure air, so as to thoroughly neutralize the impure air in the room and cause the said air to be changed not less than three times every hour by means of properly constructed impure air outlets as before recommended. This is a very difficult matter to accomplish and consequently this system of warming class-rooms should be abandoned.

Heating by means of hot water is not recommended on account of the danger of the water freezing in the pipes in exposed places, and for other reasons stated in connection with direct steam warming.

In any case every class-room should be provided with not only a dry thermometer but also a wet bulb thermometer and a well constructed hygrometer, so as to enable each class-teacher to determine the actual amount of humidity in the air as well as the temperature. It is well known that hot dry air is charged with fine particles of dust which when inhaled cause much irritation, coughing, etc., while

warm air midway between the points of complete dryness and complete saturation, which is fifty degrees, with a temperature of from sixty-five to seventy degrees F., is considered the proper atmosphere for the class-room.

From a number of careful experiments, made a short time ago by a committee of the American Medical Association, on the air of school-buildings in Cleveland and other western cities, the following facts were elicited, showing the amount of carbon dioxide in class-rooms warmed by the hot air furnace, direct steam, indirect steam, and by a combination of direct and indirect steam heating. I quote from the report of Dr. R. Harvey Reed. This excellent report states not only the temperature of the class-rooms visited but also the humidity and the percentage of carbon dioxide at the level of the floor, the mouth and ceiling, but as the air at the mouth level is that which concerns us in this paper we shall confine our remarks to figures quoted from that portion of the report.

METHOD OF HEATING.	Temperature...	Humidity.....	Carbon dioxide in 10,000 parts.
Indirect steam.....	67.0	28.7	7.068
Indirect and direct steam.....	69.5	45.7	11.253
Direct steam.....	71.5	39.3	16.753
Direct steam with open fire pl..	73.8	33.0	11.847
Hot air furnace, Smead system	68.5	97.3	11.255
Hot air furnace, Grossum sys..	67.5	40.5	10.158

You will observe that the above figures demonstrate two very important facts.

First—That in the air in the class-rooms warmed by indirect steam radiation the

amount of carbon dioxide was very much less than was found in connection with any other system of heating; and

Second—The air furnished by a combination of direct and indirect steam proved to be the nearest to the recognized standard in humidity, 45.7, while one of the best hot air furnace systems in use furnished an atmosphere containing from three to four parts more carbon dioxide and an abnormal amount of moisture, or the reverse, at or very near the same temperature.

Another and a very important feature in connection with steam heating is that the pipes can be so arranged as not only to warm the corridors, but also to warm and dry the cold and sometimes wet feet of the pupils and teachers in winter, thus preventing colds and other illness. The Yonkers High School authorities have provided feet warmers along the corridors of that fine building by means of these steam pipes, and although rather circumscribed, they are very much appreciated by the pupils and teachers.

WARMING AND VENTILATING OF SUBURBAN SCHOOL-HOUSES.

The improved system of warming by hot air furnaces, or by steam, is usually considered too expensive for those little school-houses located about the outskirts of cities and towns, and consequently other and less expensive methods for warming them must be employed. Many varieties of stoves are offered for the purpose, but that usually employed is what is termed a base-burning, gas-consuming stove, "warranted to produce an immense amount of heat from the smallest amount of coal," etc. These stoves certainly furnish much heat at a small expense, but they do not consume the deleterious gases

which they generate. Pupils in the immediate vicinity of these stoves are well warmed, while those remote from them suffer more or less from cold.

In mild weather, when only a moderate amount of heat is required, these stoves supply heat enough, but in very cold weather, when warm air is most needed, they are not equal to the demand on them, although they are pushed to a red hot heat, and every fresh air inlet, as well as foul air outlet, even to the open fireplace, is tightly closed.

Some of these school houses are provided with so-called ventilators away up near the ceiling, where they are useless, except when the air up there is very much heated they permit it to escape occasionally. These outlets are usually ornamented by an iron grating and fan like contrivance to shut and open at will by means of cords and tassels extending to a convenient point.

The good teacher usually directs these warm air outlets to be closed in cold weather, preferring warm foul air to cold pure air for the class-room. At last the air becomes so impure as to be oppressive, and in order to get a breath of fresh air the windows are thrown open, a current of cool wind suddenly strikes the pupils, and colds, bronchitis, pneumonia, etc., often result.

A careful examination of the air in one of these schools showed the enormous amount of forty volumes of carbonic acid gas in 10,000 volumes, or in other words, the air inhaled by the pupils in such class-room contained over four times the standard or healthy amount.

The kind of heating apparatus and ventilation that should be furnished school-houses in these outlying districts should embrace the following general conditions:

First—The best available hot air furnace should be properly placed in the basement (where there is one) regardless of the expense.

Second—There should be a janitor to take charge of this heater in addition to his other duties about the building.

Third—The class-room should be warmed to a temperature of sixty-five to seventy degrees F. before school begins in the morning, and this temperature should be maintained throughout the day.

Fourth—In the absence of proper ventilators, such as described before, the windows may be utilized for furnishing fresh air, not however by throwing them open in the usual dangerous manner, but by the following simple way: A pine board, from three to six inches wide, and long enough to fit accurately the place of the lower window sash, is procured, the sash is raised, the board inserted, and the sash lowered or shut down upon it. The air now enters between the upper and lower sashes, in an ascending direction, mingling with the warm impure air without causing any annoying draught on the heads of the pupils. This system of ventilation of course is at best only a make-shift or tributary aid to the object in view, (fresh air,) but in the absence of a more scientific system it furnishes much pure air and should be employed.

In case the little building on account of financial embarrassment must be warmed by stoves the following suggestions should be adopted. A stove large enough to heat the class-room being located, the room should be ventilated in the following manner:

The stove should be completely surrounded by a metallic wrap or cylinder and fastened to the floor, allowing a space of several inches between it and the stove, and it should extend to

a height of nearly five feet from the floor. A good sized cold air pipe is next taken from the outside of the building through the basement to a point exactly under the stove and extended through the floor, where it terminates just under the stove. The outer end of this pipe, or conduit, must be protected by a fine wire screen, while the inner end is provided with means for regulating the volume of fresh air. By this contrivance a good amount of atmospheric air is conveyed to the stove, warmed and diffused through the class-room without unduly warming the scholars in the immediate vicinity of the fire.

Some prefer the plan of placing the stove near a window, enclosing it half way round as above, but leaving that part of the stove near the window exposed to the cold air usually passing in between the window sash and frame. The heat just inside the window acting like a suction pump seems to draw in the cold air, warms it and delivers it in a state of expansion in the class-room. In case cold air enough is not obtained in this way, the window should be raised a little so as to supply the requisite amount.

By one or both of these plans a certain amount of fresh air is introduced, but not enough to maintain a healthy atmosphere, there being no foul air shaft accessible to remove the impure air rapidly accumulating in the class-room. In order to accomplish this desired object many plans have been suggested, none of which, so far as known to the writer, seem to completely fulfill the purpose. One of these plans, however, seems to merit a fair trial and is as follows :

The opening into the chimney for the stove pipe is enlarged so as to receive a much larger pipe, which encircles the stove pipe like a

jacket. This jacket should extend from a point say ten inches above the floor to the chimney, where it is inserted with the stove pipe. The chimney into which the stove pipe discharges the smoke should have an opening extending from the floor to a point twelve or fifteen inches above, so as to assist in removing polluted air from the room. Open fire-place aids to ventilation are now, as a rule, closed, under the impression that such openings act as a damper on the fire. On the contrary such openings rather increase combustion by the suction which the smoke creates, except only when the fire is being made, when the opening should be closed for a few minutes.

The absurd notion so generally held by not only plain people, but also by people considered intelligent, of closing every fresh air inlet, as well as every foul air outlet, during winter weather, is so pernicious in its efforts on the health of its votaries as to demand a firm protest from every sanitarian. If too much cold air finds its way to your living rooms, or school-rooms, warm it by means of a few extra tons of coal, and the saving in your doctor's bill will more than balance the expense. If you desire healthy air in your rooms, you must take it from the outside of the building, then warm it, and when it becomes impure allow it to escape through apertures provided for that purpose, otherwise your health will suffer.

SCHOOL WORK IN THE CLASS-ROOM AND ITS RELATION TO PHYSICAL CULTURE, ETC.

This subject should demand the attention not only of sanitarians and physicians, but of every thoughtful mind, on account of its close connection with the question of school hygiene and also because of its intimate relation to the future physical condition of society.

Teaching the young idea how to shoot, or, if you will, moulding the elastic minds of our children, is a matter that cannot be too carefully examined, and it behooves us who are directly concerned to point out the defective features involved in our present system of education in so far as it relates to physical culture. Doubtless there are persons who will question our motives in our efforts to criticise the actions of school authorities, and if there are any such let them be assured that any suggestions we may offer are intended for the mutual benefit of teacher and pupil.

Many of the class of persons to whom the subject of education is entrusted do not appear to fully appreciate the vast importance of their high and responsible position. They do not seem to thoroughly realize the fact that they are responsible for many of the physical imperfections acquired by young children during school hours. Defective knowledge of matters in relation to school work is due more to the system employed than to the imperfections of the teacher, and while it is admitted that some improvement in the matter of school hygiene has been accomplished of late years, yet that very much more can be achieved must be admitted.

The introduction of the kindergarten system of teaching young children is a step in the right direction as far as it extends, but is too limited in its operation and consequently does not accomplish the object in view. School authorities should devote more attention to this excellent mode of primary education, and make it a prominent feature in every school where young children are compelled to attend. The kindergarten method intelligently practiced and a well appointed gymnasium established in connection with every school, will

accomplish much needed reformation in mental and physical education.

The evil effects of our present imperfect system of acquiring book knowledge are very clearly illustrated in the pale features and general appearance of so many school children, and yet those defective educational methods, including parrot-like recitations and cramming, alone, would not effect the physical or mental condition of the pupil to the extent usually attributed to them were it not for the defective ventilation of school-rooms. But when the deleterious effects of cramming and foul air are combined in the class-room, the pupils are sure to suffer from the combination.

Passing over the imperfect construction of school buildings, the defective methods of heating and ventilating class-rooms, etc., we will now proceed to make a brief examination of the qualifications of teachers and the rules so rigidly enforced by them, not only in common schools and parochial schools, but also in many fashionable private schools.

As a rule, children are compelled to attend school too young. Girls ought not to be required to attend school under seven years of age, and in no case should boys be subjected to the rigid discipline of a school under nine years. Experience has very positively demonstrated the important fact that the pupils who begin their studies at the age of say seven to nine years, were quite as far advanced in book learning at sixteen as those who commenced at the age of five years, and that they were physically and mentally in better condition to continue their higher studies to a successful termination.

In advocating these rules, however, do not understand us as being opposed to home education for the child before entering school.

When possible the child should be instructed by its mother, or other members of the family, so as to be able to read before entering school, but in case kindergarten training can be obtained this home instruction may be omitted.

Many deformities, so often observed by the physician, can be charged directly to premature development of the young mind, rigid school rules, and the impure air which they are compelled to inhale in badly ventilated classrooms. But little, if any, effort is being made by school authorities to provide chairs, benches or desks having the shape necessary for enabling the pupil to assume and maintain the position calculated to afford unrestrained healthy development of the body. School furniture is usually selected not on account of its adaptability to the pupil, but rather for its beauty of shape and low price.

The deformities caused by neglecting or ignoring apparently insignificant details in connection with school furniture are more numerous than generally admitted, not only in the selection of the furniture, but also in placing the same in position so as to obtain the requisite amount of light, etc.

Now, let us see how our school teachers are generally appointed and what qualifications are required of them. The candidate, after passing a satisfactory examination, either before a board of examiners or the superintendent of schools, presents herself or her application to the school board, and if her references are good, etc., she is appointed. Our young teacher, being fresh from the mill, is well up in all the rigid rules of school discipline. She is placed in charge of a class of from forty to eighty children. She knows little or nothing of human nature, or of the peculiarities or nervous susceptibilities of the pupils, and yet

she undertakes the difficult task of moulding their young minds, and does it after the manner of her own education.

Any person having a certificate is good enough, in the opinion of some school authorities, to teach the primary classes, forgetting the fact that "as the twig is bent the tree will grow," and that true education demands the best talent in the primary department of schools.

The unfortunate children are now placed on benches, forming long rows, with perhaps no support to their backs, and their feet hardly touching the floor, not allowed to look to the right or left, nor yet rest their eyes by looking up. The overheated and suffocating air of the class-room soon becomes intolerable and the children and teachers become restive and irritable to a degree, demanding fresh air; but as this desirable article cannot be procured, on account of defective ventilation, the windows must be raised so as to admit the desired oxygen.

The sudden rush of cold air on the overheated pupils frequently causes colds and acute lung diseases. But the cramming must go on, with very little relaxation or physical exercise, and thus the routine stuffing and cramming go on, constantly increasing from one grade to another, piling on study after study, many of them unnecessary and unsuited to the pupil, until at last the physical powers succumb, and relief is sought at the hands of the physician.

When our youthful teacher remains long enough to know something of the nature and management of children she deliberately and even without the consent of the school authorities, enters the matrimonial state, and for her presumption she forfeits her position of teacher, and her now valuable services are forever lost to the cause of education.

Thus we go on patiently submitting to this everlasting changing year after year without any radical improvement, with only an occasional exception on the part of some patriotic maiden lady who is interested more in the education of other people's children than her own.

Just how to prevent this natural tendency of our young teachers is a question which should claim the profound attention of school boards, and doubtless the combined wisdom of those august bodies will solve the difficult problem.

Both men and women teachers in our common schools seek the position of educator not for a permanent occupation, but rather to prepare themselves for higher or more lucrative places, and consequently the soul of the instructor is not fully bestowed in his temporary occupation, and it is safe to say that complete success is seldom if ever achieved in the prosecution of a business or profession where the whole energy of the individual is not completely enlisted in his work.

The ideal teacher should, in addition to the usual routine educational capacity, have the following qualifications :

First—She should be competent to govern herself in every emergency.

Second—She should be a good judge of human nature, and able to rapidly recognize the educational capacity and drift of the young student's mind and to direct it accordingly.

Third—She should have broad views on all topics relating to sound education and be thoroughly conversant with the questions and literature of the day including a practical knowledge of hygiene.

Fourth—She should be of good moral character and a consistent member of some christian denomination.

Fifth—She should have at least the average amount of common sense.

Common sense may and no doubt is considered a secondary consideration in the opinion of many educators, yet it is most essential, and unless it is born in the individual there is not much prospect of acquiring it.

If I were asked to define the term common sense it might be difficult; but it will be sufficient for our purpose now to say, that it consists in applying rational, simple rules of construction to the various theories of educational rules in and out of the class-room. But you may ask what have the qualifications of teachers to do with school hygiene and physical training? Sanitarians have much to do with the whole subject of education in all its branches. It is a part of their business to improve the mental and physical condition of those destined to shape and direct the destinies of future generations. The sanitarians and physicians can, if they will, by their intelligent advice accomplish more complete reformation in school work than all other professions combined.

They can reform the school board and the school teacher, as well as the general public, by educating and directing them onward to a more thorough appreciation of those simple yet important laws of hygiene and physical culture by the observance of which alone health, vigor and true education can be achieved.

Sanitarians and physicians should protest against much of the present system of cramming and parrot-like recitations. They should see that unnecessary studies are dropped from the curriculum, and encourage the study of those branches that are especially adapted to the ability of the pupil. They should demand representation on school boards in order that

they may point out the defective features in connection with education in its relation to physical culture.

The singular notion of expecting every pupil to become proficient in every branch of school work seems to pervade the lofty minds of many educators. Every boy is expected to bloom into a scientific prodigy, and every girl into a lady of leisure, while physical culture is almost completely ignored.

Even now the study of physiology is recommended, and not only recommended but is actually made a part of the curriculum in many schools, and for what useful purpose does not appear. We are told that knowledge is power, and that the study of this important and difficult branch of medical science will enable the rising generation to become proficient in the knowledge of how and what to do that they may live long and happy lives without dosing themselves with doctors' drugs—in short, to enable them to avoid all the “ills that flesh is heir to.” Pope says :

“A little learning is a dangerous thing ;
Drink deep, or taste not of the Pierian spring.”

Will the smattering of physiology now procured through defective channels compensate the average student for the time devoted to this innovation ? I think not. Every physician of experience can recall cases of unmanageable cranks—if I may be allowed the expression—in his practice, who imagined, from their smattering of medicine, that they knew more of their diseases, or the complaint of some other person, than the physician in attendance. We know that in order to understand physiology thoroughly we must also study anatomy, and that a thorough knowledge of the first cannot be achieved without a knowledge of the second.

If it could be proved that the imperfect knowledge of this science, as now imparted in our schools, tended in any practical degree to promote the physical well-being of the average student, sanitarians and physicians would be found in the front rank encouraging its study. We are told that a knowledge of physiology will enable us to avoid, among other things, the use of alcoholic stimulants and tobacco. Nonsense. We know better. Take, for example, our college educated men, our wealthy men, our professional men, and those who constitute what are termed the higher circles of society, and who are supposed to be educated, and see how many of them abstain from the use of stimulants and tobacco. Is it not a fact that there is more wine drank and more tobacco used by them than by the most ignorant in the land? Is it not the wealthy and educated people who have called into existence, and now maintain, all the magnificent rum palaces so numerous all over the country?

Or take the medical profession, whose knowledge of physiology cannot be well questioned, and place its members on the dissecting table and see if they are all perfection in respect to stimulants and tobacco. I do not mean to say, or even to insinuate, that medical men are not models of everything that is correct, yet I must say that any person wishing to avoid the use of tobacco should attend one of our meetings.

The time and mental effort required to acquire even a smattering of physiology in school could be used in gaining more useful information, or in gymnastic exercises.

There are other studies now insisted on that might with advantage be excluded from the regular course of school work, but as great reformations were never accomplished without

determined and persistent agitation, we cannot expect to at once overthrow the present and long practiced system of cramming. Still we can, if we will, materially improve the present mistaken notions of imparting education to our children.

By our past and present forced system we demand, and in fact accomplish, more routine book learning from our students at the premature age of eighteen years than is required of pupils in European countries at the age of twenty-one. Is this wise? Is it just or is it humane to thus force the intellectual faculties at the expense of the physical powers? Most assuredly not. Mental and physical education should harmonize, and the first should not be acquired to the detriment of the second.

Physicians are frequently consulted by young girls suffering from nervous prostration, debility, loss of appetite, loss of sleep, dyspepsia, hysteria, chorea, headache, neuralgia and many other complaints caused by mental overwork. The hours of study, although somewhat shorter than formerly, are still too long. This fact is painfully perceptible in the general expression of the pupils toward the end of the school year, this being especially the season of cramming for examinations, etc.

During an investigation by a school board, in a neighboring city not long ago, some remarkable evidence was procured, showing that, among other things, many of the pupils in the higher grades of the school spent from nine to fourteen hours of each day in study and recitations, in and out of school, and at or near examinations still longer hours.

This shameful stuffing and cramming should not be tolerated in either public or private schools. Sanitarians and physicians should unite in protesting against a system of so-

called education which so unerringly and irresistibly tends to premature decay.

As a remedy for this mental overwork we would suggest the enactment of some general law, to compel all school managers to equalize their school curriculum, and enforce a general rule demanding certain hours for study and certain other hours for exercise and recreation, and to see that during recreation no studies are allowed.

Until some such law can be enforced stuffing and cramming will go on, and candidates for consumption, and other wasting diseases, will continue to graduate from our educational institutions. The anxiety, the mental strain, the excitability attending the June examinations all crowd on the young mind, often causing the physical wreck of the candidate for school honors.

Young girls are obliged to go through this terrible strain at a time when repose is most essential for the future woman. The natural aptitude and overwhelming ambition of our American youth seems to almost irresistably urge them on to the accomplishment of educational achievements above and beyond the youth of any other country.

We have the material second to none, and far in advance of all other nations, thoroughly capable of being developed into the brightest intellects, if we will only insist upon these simple yet essential rules of co-operative mental and physical education.

Overworking the children in all our schools is a matter of serious consideration, and while it is admitted that education tends to diminish crime, and that the education which prevents crime must necessarily become a prominent factor in political economy by reducing sickness and mortality to a minimum, yet that

education should not be procured to the detriment of physical culture.

“Education and sanitation represent great forces invoked by man in the effort to prolong his life and improve his condition—one the science and art of culture, the other the science and art of health. As terms they may not always have been present in the vocabulary of the ancients, but the ideas they express, the facts which they include, and the objects at which they aim, are ever present in the human mind and are as universal in man’s experience as death and sickness and ignorance, which they antagonize.”

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